

PATENT SPECIFICATION



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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in or relating to Formwork for Use in the Casting of Concrete Structures

We, A. MONK & COMPANY LIMITED, British Company, of Green Lane, Padgate, Warrington, in the County of Lancaster, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement;—

This invention relates to formwork for use in the casting of concrete structures, and has for its object to provide formwork of so-called "moving" type which is adapted for use in the casting of structures having a number of battered or sloping sides or faces, or in which all sides are battered. Hitherto, so far as we are aware, the use of moving formwork has been restricted to the casting of structures having vertical parallel sides and includes formwork or shuttering defining the section of the structure to be cast, such formwork or shuttering being supported by a plurality of yokes which are raised as required by jacks and jack bars in known manner.

According to the invention, formwork apparatus for the casting of concrete structures having battered sides comprises yokes for supporting opposed formwork, transoms supporting said yoke, wheels supporting said transoms at each end and running on main transoms disposed normal to said first mentioned transoms, means for lifting said main transoms, and means for moving said wheeled transoms towards each other during raising of the said main transoms by the lifting means.

The invention is further described with the aid of the accompanying drawings which illustrate, more or less diagrammatically and by way of example only, one mode of embodiment.

In said drawings:—

Fig. 1 is a plan view showing the disposi-

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tion of yokes supporting the formwork or shuttering for a pier having two opposed battered sides *y* and two opposed vertical sides *x*. 45

Fig. 2 is a section taken as on *a-a* of Fig. 1 and including external platform supporting scaffolding. 50

Fig. 3 is a section taken as on line *b-b* of Fig. 1.

Fig. 4 is an elevation of an opposed pair of yoke-supporting wheeled assemblies, and

Figs. 5 and 6 are sections taken respectively on lines *c-c* and *d-d* of Fig. 4. 55

Fig. 7 is a fragmentary view showing a lifting jack and jack-bar for the yokes.

Referring now to the drawings, the lifting gear for the formwork, i.e. jacks and jack-bars of known type and generally designated 10 (see Fig. 7), is confined to the vertical and parallel faces *x* (Figs. 1 and 2) of the pier structure, and forms or shuttering 11 for the battered sides *y* (Figs. 1 and 3) of the pier are supported by yokes 12 which are similar to the type of yoke as used in conventional moving formwork, with the exception that the jack rods and jacks are omitted. These, what may be termed "dummy yokes" 12, are carried by means of beams or girders 13 (hereinafter referred to as "dummy transoms") the ends whereof are supported by a second set of beams 14. This second set of beams 14 (hereinafter usually referred to as the "main transoms") is carried and raised by the yokes 15 provided for the vertical parallel faced sides *x* of the structure which is to be constructed. 80

The dummy transoms 13 are so arranged that movement of the dummy yokes 12 in any direction is not possible except by moving said dummy transoms 13.

The dummy transoms 13 are supported at each end by wheels 16^a which run upon

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the main transoms 14 in such a manner as to prevent any movement of the assembly in a direction at right angles to its line of travel along the main transom 14 yet permitting controlled movement in a direction along the line of the main transoms.

According to one embodiment, there are provided at each end two sets of wheels 16^a running in tandem fashion along a single track constituted by the main transom 14 and at a suitable distance apart so as to give stability to the dummy transoms 13 to which the dummy yokes 12 are attached, and in order to prevent the lifting of the wheels from said track a head beam 16 connects transoms 13 and is attached to the main transoms 14 by means of ties 17 (Figs. 4 and 5) with springs 18 slidably associated with said transom. In order to facilitate the free running of the wheels, each preferably consists (see particularly Fig. 6) of three circular components 16^a, 16^b, 16^c running side by side and separated by washers only. The central component 16^a is located in a gap 14^a provided for it in the main transom 14 and the two outer components 16^b, 16^c run upon the top surface of said transom. The angle of the dummy yokes 12 to the vertical is of course, adjusted as by wedging or set screws to correspond to the required angle of batter.

Corresponding ends of opposing dummy transoms 13 are adjustably connected by means of steel tie-rods 19 the ends of which are provided with a suitably cut left and right handed screw-threads 19^a, 19^b whilst the respective head beams 16 are provided each with an internally screw-threaded tube or nut component wherein the screw-threaded ends 19^a, 19^b are operatively engaged. Said tie-rod may be turned, say by a handle 21, to draw together the wheeled transoms 13 and stop members 22 welded to transom 14 engage with stop collars 23 of said tie rod 19 to locate same relative to said transom. A revolution counter or the like may be associated with the draw-up assembly whereby horizontal movement of the dummy yokes 12 may be synchronised with their vertical movement to obtain a uniform angle of slope. The length of the screw-threads 19^a and 19^b formed in the tie bar 19 is such as to allow the full horizontal distance of the total batter to be taken up. 25 (Fig. 2) generally denotes scaffolding arranged to support working platforms 26 upon which operatives may work and 27 denotes an internal platform upon which operators controlling the formwork may stand. This latter platform is supported on cross beams 28 connected to the main yokes 15.

The external formwork associated with the yokes 12 and 15 is arranged in such a manner that vertical edges of the forms 11

for the battered sides y of the construction are arranged to make close contact with the internal faces of the forms 24 for the vertical parallel sides. As the tie-rod 19 is turned the forms 11 for the battered sides are drawn toward each other, thereby exposing and rendering inoperative part of the forms belonging to the vertical parallel sides.

With regard to the internal formwork, that in respect of the battered sides requires no special construction but that for the vertical parallel sides requires to be of a nature which permits of a reduction in width according to the slope of the battered sides. One method of effecting such reductions is to construct the forms in two or more parts, one part being of a width not greater than the minimum width of the structure at its narrowest point, and the other part or parts of the form being adapted for sliding or telescopic association with said first part and having chamfered leading edges.

The hereinbefore described apparatus may, with appropriate modifications, be employed in the construction of walls the battered sides whereof are not parallel faced. In such a case, dummy half yokes are provided for the battered sides, each half yoke being adjusted to the required angle of slope. The external and internal yokes are carried on separate dummy transoms which are provided with separate carriages, or wheels, of a type similar to those previously described. Corresponding pairs of carriages or wheels are connected, as before by tie-rods, the difference in horizontal movement required for the external and internal faces of the structure respectively being compensated for by rotating the tie-rods to external and internal faces at differing speeds.

WHAT WE CLAIM IS:—

1. Formwork apparatus for the casting of concrete structures having battered sides, comprising yokes for supporting opposed formwork, transoms supporting said yokes, wheels supporting said transoms at each end and running on main transoms disposed normal to said first mentioned transoms, means for lifting said main transoms, and means for moving said wheeled transoms towards each other during raising of the said main transoms by the lifting means.

2. Formwork apparatus for the casting of concrete structures as claimed in claim 1, wherein said main transoms are supported by yokes associated with the lifting means.

3. Formwork apparatus for the casting of concrete structures as claimed in claim 1 or claim 2, wherein opposed wheeled transoms are connected by a tie-rod or rods including means for drawing said wheeled transoms towards and away from each other.

4. Formwork apparatus for the casting

of concrete structures as claimed in claim 3, wherein the ends of said tie-rod, or rods are screw-threaded and operatively engaged with internally screw-threaded tube or nut components associated with each wheeled transom, and means are provided for turning said tie-rods.

5. Formwork apparatus for the casting of concrete structures as claimed in claim 3 or claim 4, wherein a revolution counter is associated with the tie-rod mechanism.

6. Formwork apparatus for the casting of concrete structures substantially as hereinbefore described and illustrated in the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements in or relating to Formwork or Shuttering for Use in the Construction of Concrete Structures

We, A. MONK & COMPANY LIMITED, British Company, of Green Lane, Padgate, Warrington, in the County of Lancaster, do hereby declare this invention to be described in the following statement:—

This invention relates to formwork or shuttering for use in the erection of concrete structures, and has for its object to provide formwork of so-called "continuously moving" type which is adapted for use in the formation of structures having a number of battered or sloping sides or faces, or in which all sides are battered. Hitherto, so far as we are aware, the use of moving formwork has been restricted to the casting of structures having vertical parallel sides and includes formwork or shuttering defining the section of the structure to be cast, such formwork or shuttering being supported by a plurality of yokes which are raised as required by jacks and jack bars in known manner.

The present invention broadly resides in the provision in moving formwork apparatus of means whereby the yokes supporting opposed forms or shuttering for battered surfaces may be shifted horizontally and vertically at one and the same time in accordance with the required batter.

The invention is further described, by way of example only, in relation to the casting of a hollow pier of rectangular section in which two opposed sides are required to be battered but have parallel inner and outer faces. In this instance, the lifting gear for the formwork, i.e. jacks and jack bars, is confined to the vertical and parallel faces of the structure, and forms or shuttering for the battered sides are supported by yokes similar to the normal type of yoke as used in conventional moving formwork, with the exception that the jack rods and jacks are omitted. These, what may be termed "dummy yokes" are carried by means of beams or girders (hereinafter referred to as "dummy transoms") the ends whereof rest upon a second set of beams. This second set of beams (hereinafter referred to as the "main transoms") is carried and raised by the yokes provided for the vertical parallel

faced sides of the structure which is to be constructed.

Said dummy transoms are so arranged that movement of the dummy yokes in any direction is not possible except by moving the dummy transoms.

The dummy transoms are supported at each end by a carriage, the wheels whereof run upon the main transoms in such a manner as to prevent any movement of the carriage in a direction at right angles to their line of travel along the main transom, yet permitting controlled movement in a direction along the line of the main transoms.

According to one embodiment, each carriage is provided with two sets of wheels running in tandem fashion along a single track and at a suitable distance apart so as to give stability to the dummy transoms to which the dummy yokes are attached, and in order to prevent the lifting of the carriage wheels from said track, a head beam is attached to the main transoms by means of a suitably sprung and bolted connection. In order to facilitate the free running of the said wheels, each set consists of three wheels running side by side and separated by washers only, the central wheel being located in a gap provided for it in the main transom and the two outer wheels run upon the top surface of the main transom. The head beam is of a length sufficient to allow the carriage to travel the full horizontal extent of the batter. The angle of the dummy yokes to the vertical is adjusted to suit the angle of the required batter.

Corresponding carriages of opposing dummy transoms are adjustably connected by means of tie-rods, and one method of providing such tie-rods is to attach to one carriage a steel bar the end of which is provided with a suitably cut screw-thread, whilst the corresponding opposite carriage is provided with a tube having an internal diameter such as to permit the bar from the other carriage to enter freely therein. The end of said tube is provided with locating rings to hold in position a roller bearing whereto is attached a turnbuckle adapted

to rotate freely and co-axially about said tube and provided with a thread at its end furthest from the tube for engaging with the screw-thread cut into the steel bar. The turnbuckle is also provided with a locking device and has also attached to it a revolution counter whereby horizontal movement of the dummy yokes may be synchronised with their vertical movement to obtain a uniform angle of slope.

In order to ensure that opposed dummy transoms are drawn together at the same time, said turnbuckle is securely located in required position relative to the main transoms by means of suitable stops fixed to the transoms. The length of screw-thread required to be formed in the tie-rod bar is such as to allow the full horizontal distance of the total batter to be taken up by the turnbuckle.

The external formwork associated with the yokes is arranged in such a manner that vertical edges of the forms for the battered sides of the construction make close contact with the internal faces of the forms for the vertical parallel sides. As the turnbuckle is operated, the forms for the battered sides are drawn toward each other, thereby exposing and rendering inoperative part of the forms belonging to the vertical parallel sides. The internal forms for the battered sides of the structure are of more or less conventional construction.

It will be seen that the forms for the vertical parallel sides of the structure require to be of a nature that allows for a reduction in their operative horizontal width

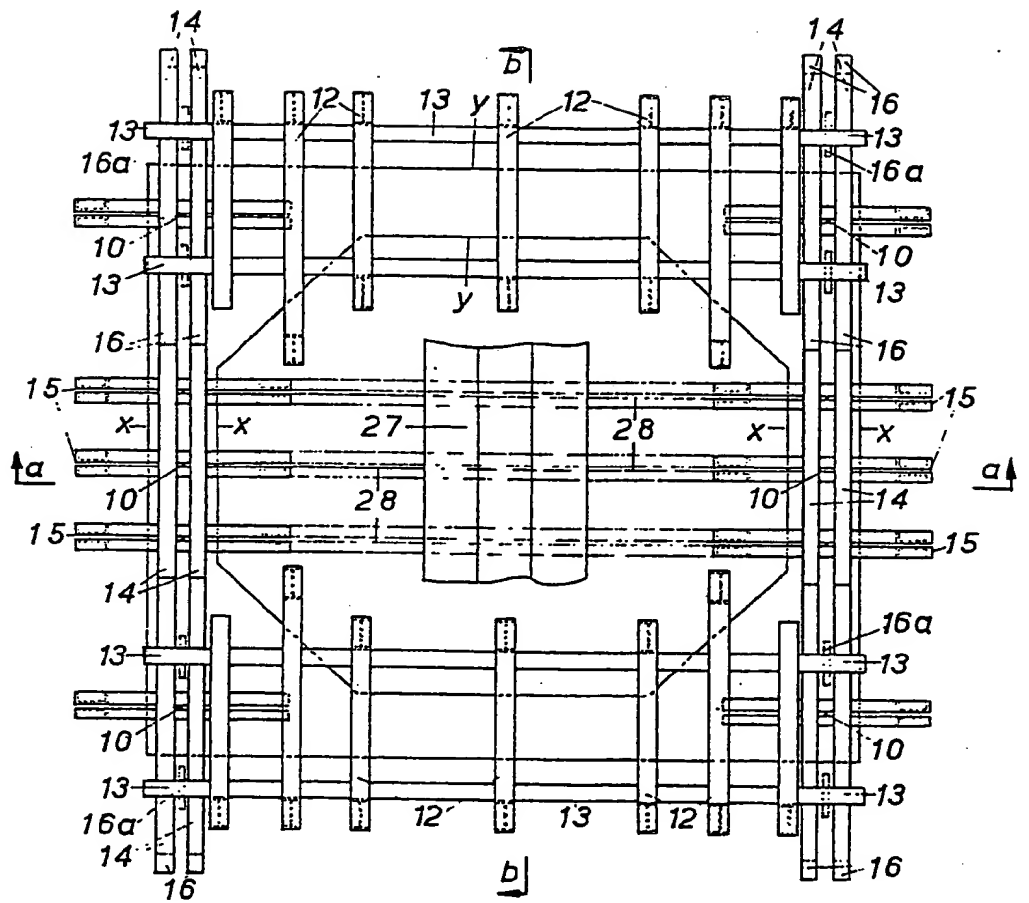
in accordance with the required batter, and one method of providing for such reduction is to attach a form of constant size to the main yokes, the length of such form being not greater than the minimum width of the structure at the point where maximum batter has been achieved. The forms which take up the horizontal distance of the batter consist of steel sheeting chamfered at the leading edge, these forms constituting a telescopic continuation of the internal form for the battered side.

The hereinbefore described method and apparatus may, with appropriate modifications, be employed in the construction of walls the battered sides whereof are not parallel faced. In such a case, dummy half yokes will be required for the battered sides, each half yoke being adjusted to the required angle of slope. The external and internal yokes are carried on separate dummy transoms which are provided with separate carriages, said carriages being of a type similar to that previously described. Corresponding pairs of carriages are connected, as before, by tie-rods and turnbuckles, the difference in horizontal movement required for the external and internal faces of the structure respectively being compensated for by rotating the turnbuckles to external and internal faces at the differing speeds.

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FIG 1



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SHEETS 1 & 3

FIG 3

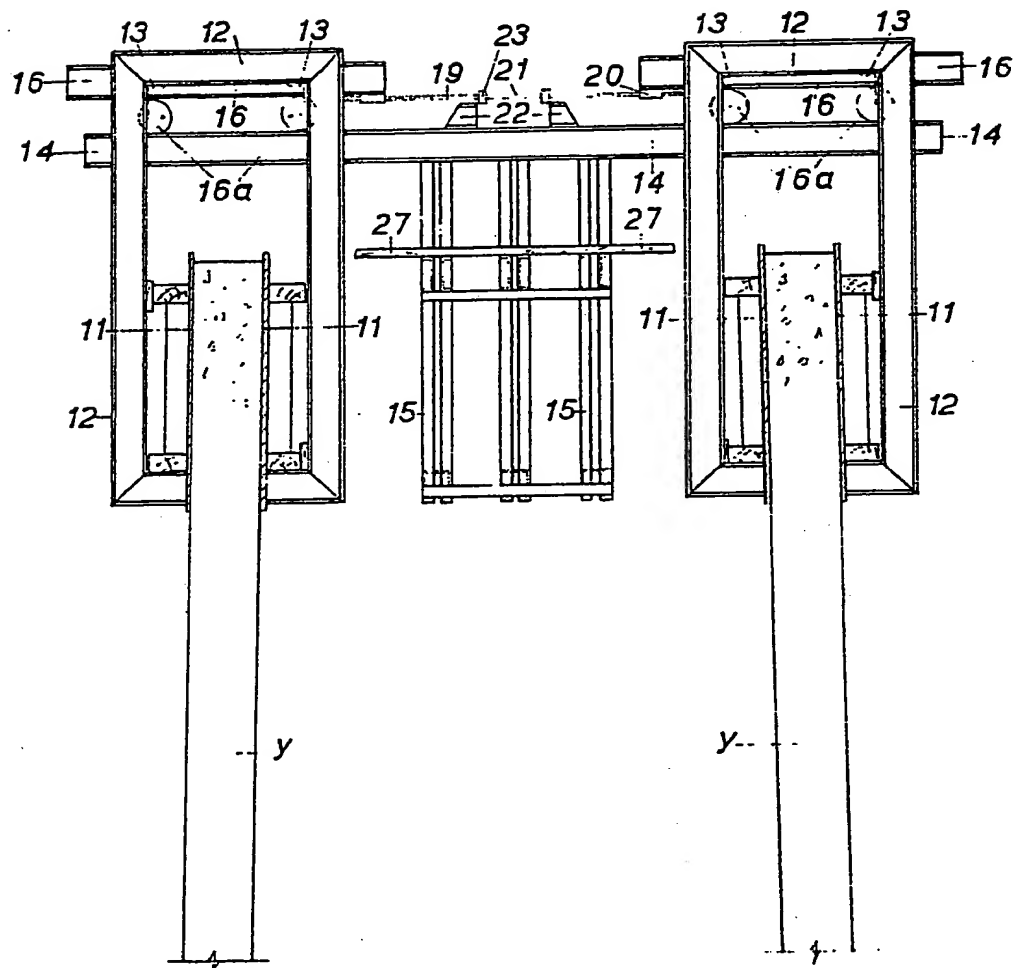
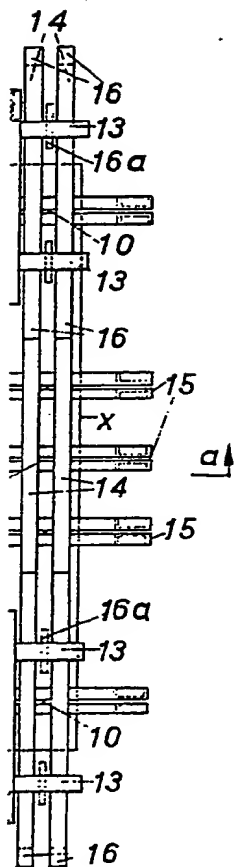


FIG. 1

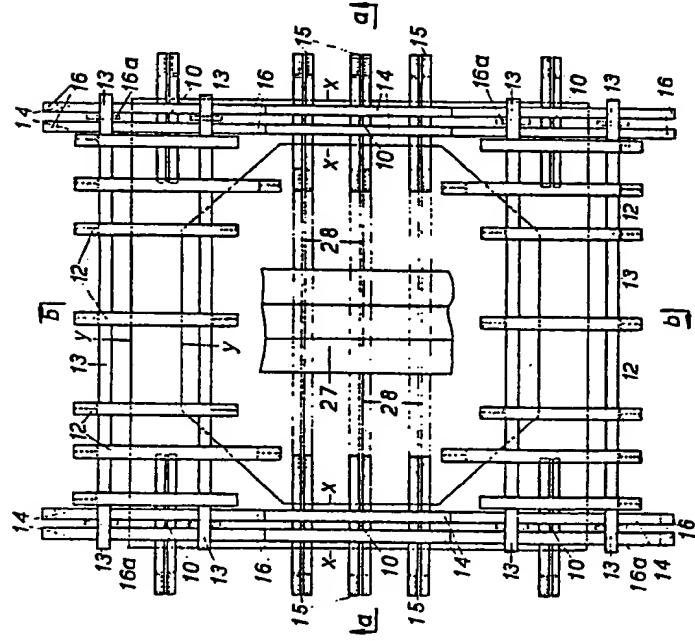
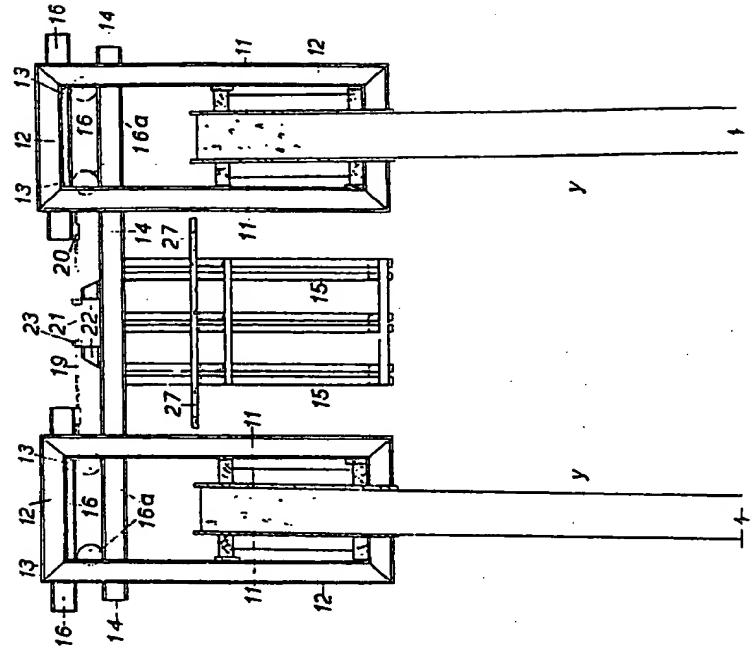


FIG. 3



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SHEET 2

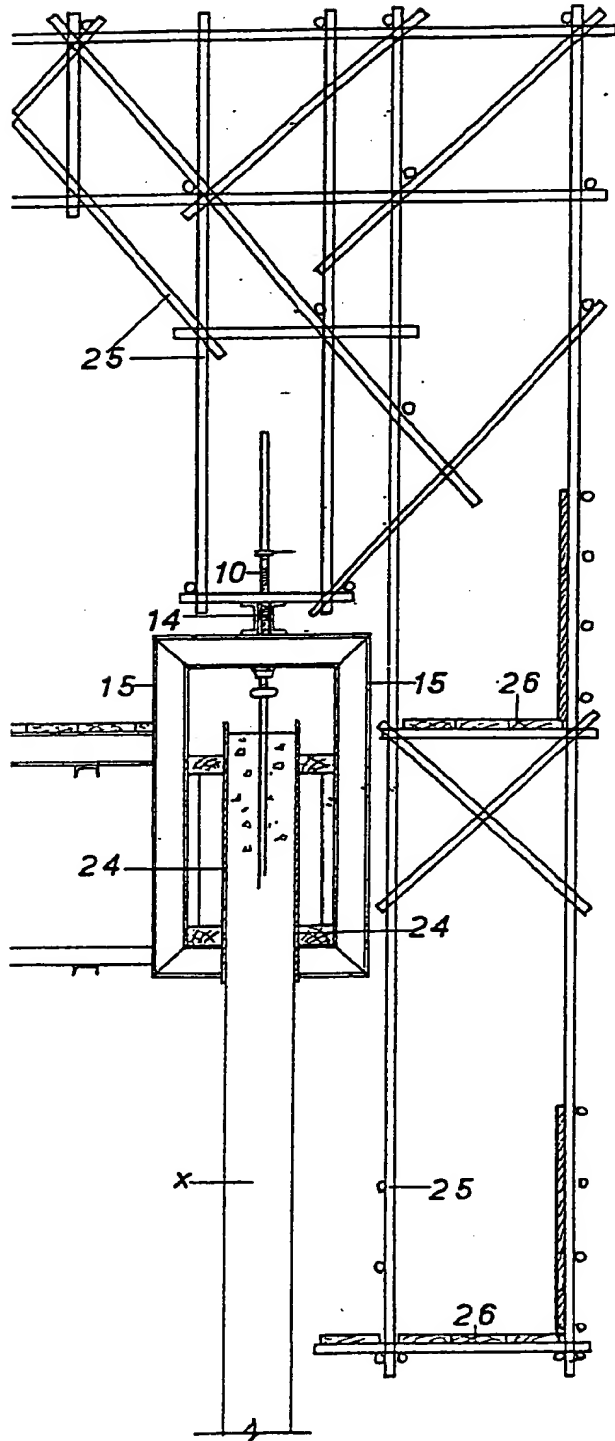


FIG 7

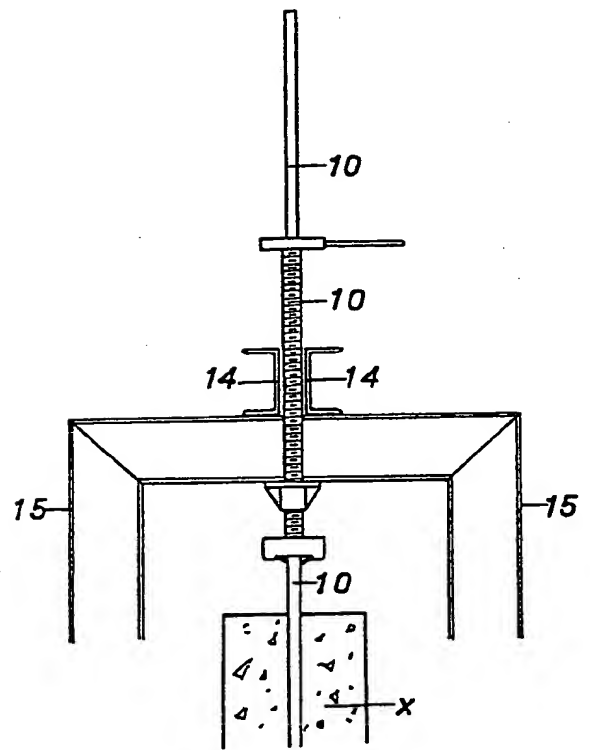


FIG. 2

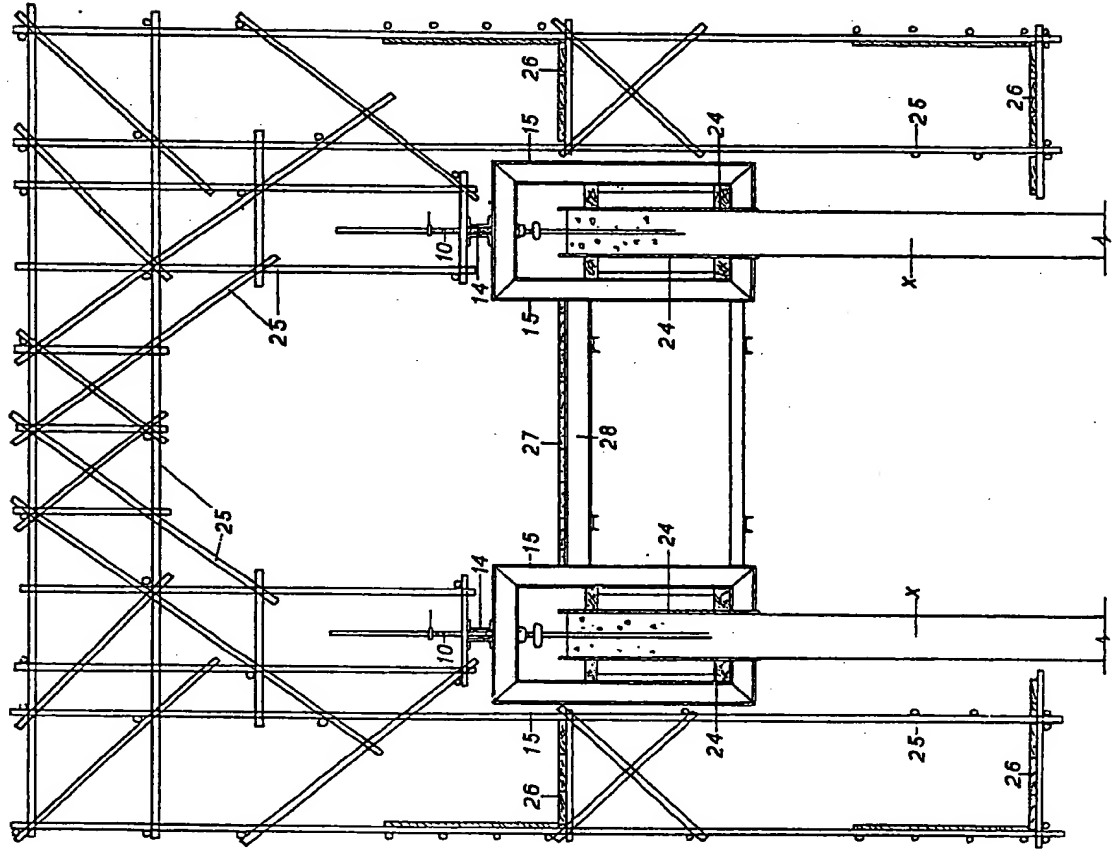
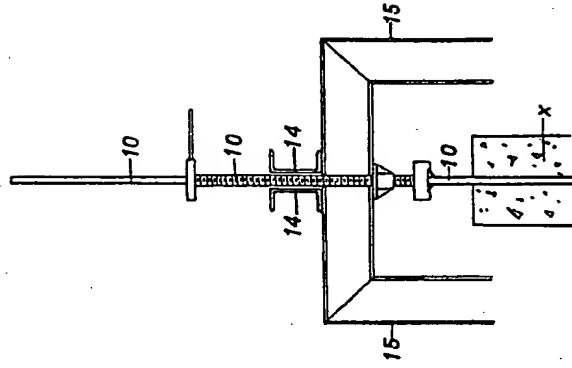


FIG. 7



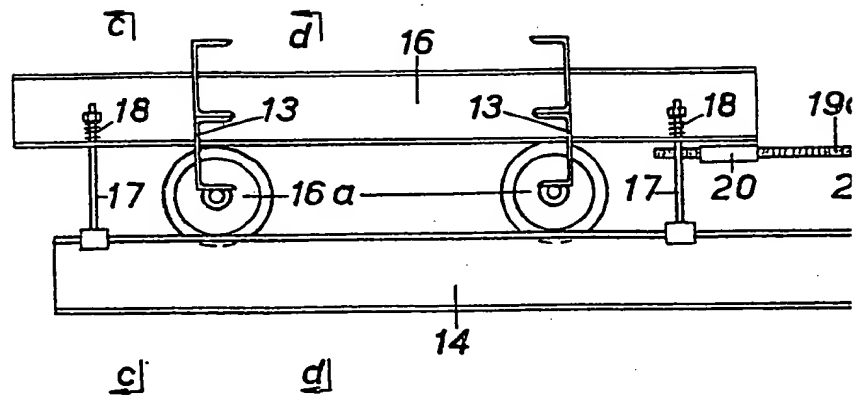
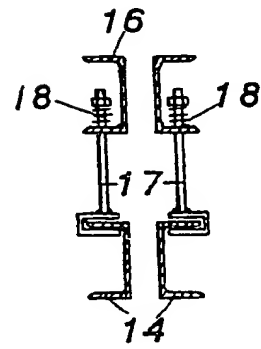


FIG 5



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SHEET 4

FIG 4

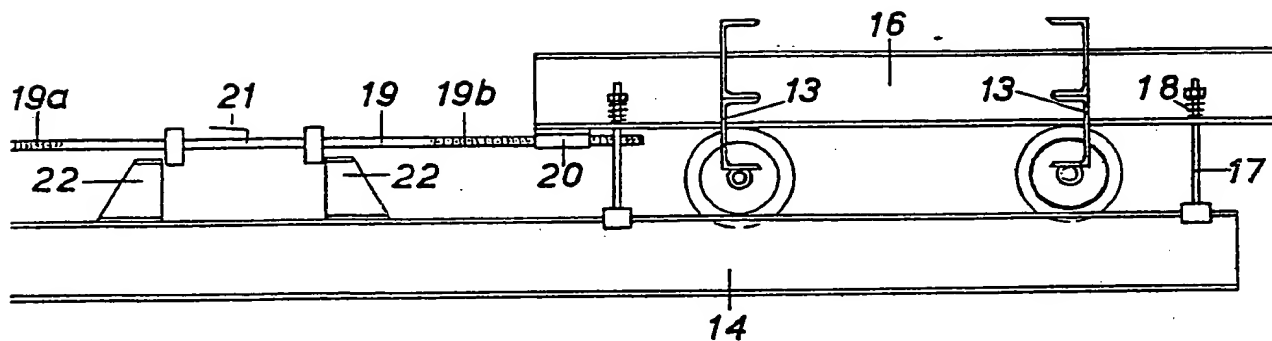


FIG 6

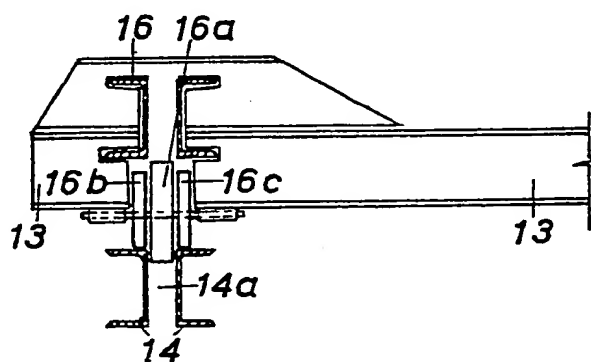


FIG 4

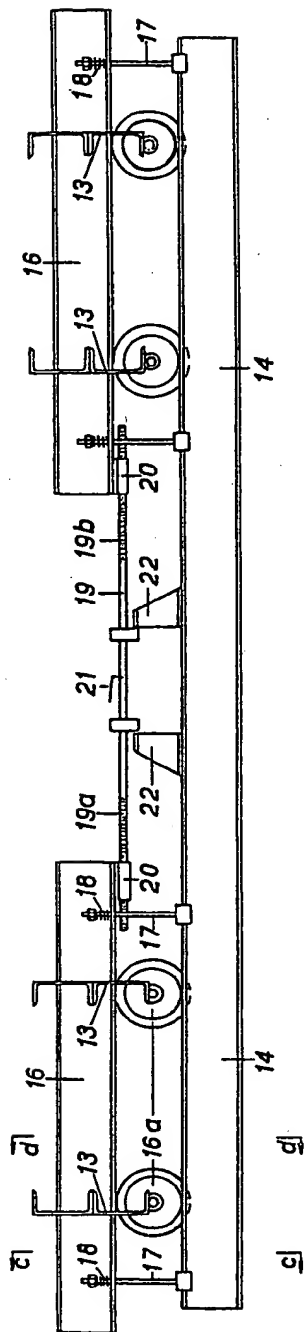


FIG 5

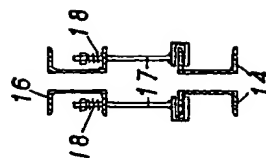
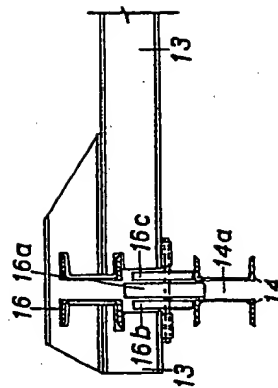


FIG 6



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